[redacted] No. 7506.03 STATINTL

STATEMENT OF WORK

for

STATINTL [redacted]

15 June 1964

STATINTL [redacted]

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500020004-0

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STATINTL 1.0 SCOPE

STATINTL 1.1 This document describes the work to be performed by [redacted] for the development and fabrication of diffraction gratings for an experimental direct image viewer, as covered by [redacted]

1.2 The scope of work shall be broken down into three phases as follows: Phase I, investigate the various methods of obtaining the desired grating characteristics; Phase II, rule 2 inch x 2 inch gratings to test the methods selected; Phase III, upon successful completion of Phase II, a 10 inch x 10 inch master will be ruled and four each replicas from the 10 inch x 10 inch master will be provided.

2.0 APPLICABLE DOCUMENTS

STATINTL 2.1 [redacted]S-7506, Experimental Direct Image Viewer, Specification for

3.0 REQUIREMENTS

3.1 The technical design goals of the 10 x 10 transmission grating replicas which are to be produced during Phase III shall be as follows:

3.1.1 Grating area 10 inch x 10 inch minimum.

3.1.2 Size of glass blank. 11 inch x 11 inch or 15.5 inch diameter overall. Maximum thickness shall not exceed 0.375 inches.

3.1.3 Wavelength band to be used in the viewer. (To be supplied within 45 days from receipt of go-ahead.)

3.1.4 The grating shall disperse nine orders consisting of the central order and four orders on each side of center to the required amounts, as stated in 3.1.5. Any additional orders as long as they are much less in intensity are acceptable.

3.1.5 The nominal angular deviation of the various orders shall be:

First order	1^{o} 9'
Second order	2^{o} 18'
Third order	3^{o} 27'
Fourth order	4^{o} 35'

The tolerance for each of the above deviations shall be $\pm$ 10% of the above angles.

3.1.6 Intensity variations throughout the nine orders shall be no greater than 40% between adjacent orders and no greater than a 2:1 ratio between the lowest and highest order in the nine central orders. The intensity variation check shall be made with a spectral light source of the type to be used in the completed viewer and collimated light falling on the grating normal to the unruled side of the grating. A telescope and detector will be used to measure the order intensity.

3.1.7 The transmission of the order which transmits the minimum amount of light shall be at least 7% of the light intensity falling on an individual grating.

3.1.8 Parallel light rays shall strike the gratings when they are used in the viewer.

3.1.9 Glass quality: striae free through the faces.

3.1.10 Plane figure - maximum of 10 arc minute slope error.

3.2 Phase I

3.2.1 During Phase I various methods shall be investigated and the ones most probable of success selected for trial in Phase II. Some of the methods to be considered during this Phase are:

1. groove shaping
2. ghost grating
3. double grating

with emphasis placed on the use of techniques such as 1. and 2. which use only one grating.

3.2.3 At the conclusion of this phase of work a meeting will be held at [redacted] and the final report reviewed and discussed. Considering the recommendation made in the final report and the discussions at the meeting, a decision shall be made on which method to begin Phase II.

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3.3 Phase II

This phase may be broken down into four separate fabrication trials. Each trial will consist of the manufacture of a 2" x 2" ruled master grating and two transmission replicas. The design plan to be employed for each master made will be approved by [redacted] before started. The relative and actual intensity of the various orders and their angular deviations shall be measured and compared to the specifications listed in Section 3.1. Once these specifications have been achieved, the reliability of the technique will be discussed in the final report of 3.5.3.1 and a decision made to stop Phase II efforts and begin with Phase III.

Phase II will include the following individual steps:

3.3.1 The first master and two transmission replicas will be produced in accordance with design plan selected at the end of Phase I. The trial fabrication shall include a test record of all results which are to be submitted to [redacted] Inc., with replica gratings. If the results of this trial do not meet the technical specifications of Paragraph 3.1, proceed to the next trial.

3.3.2 Upon agreement of the design plan to be used in the second trial, produce the second master and two transmission replicas. Test and record all results and submit along with replica gratings. If unsuccessful, a meeting will be held to review progress prior to proceeding.

3.3.3 Upon approval to proceed, produce a third master and two transmission replicas in accordance with the design plan selected. Submit test results and replica gratings after completion of tests. Again, if unsuccessful, proceed to the final try.

3.3.4 Produce the fourth master and transmission replica with the design plan selected. Submit results and replica gratings after completion of tests.

If the fourth trial is unsuccessful, a project review meeting will be held to review and determine what future project actions will be required.

If the fourth trial is successful, or at the conclusion of an earlier successful trial, [redacted] will submit a firm quotation to [redacted] for the cost of fabricating a maximum of four (4) each diffraction gratings in accordance with Paragraph 3.4.

3.4 Phase III

The Phase III effort will consist of the manufacture of a master 10 x 10 inch ruled area grating and the production of four (4) replicas as specified by Section 3.1. Once the design plan has been successful in Phase II and it has been reviewed and approved by [redacted] to use this technique in Phase III, [redacted] shall produce a master and the required replicas with this technique whose design goals shall be as in Paragraph 3.1.

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These four (4) replicas shall be delivered to [redacted] upon completion of testing for conformance to the design goals.

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3.5 Reports

3.5.1 Phase I

Two reports shall be delivered, one monthly letter report, half way through study, and the final report with recommendations on best techniques.

3.5.2 Phase II

First Grating

3.5.2.1 Reports will consist of two monthly letter progress reports and final report, containing test data to be submitted with the replica gratings.

3.5.2.2. Second through fourth grating same as above but with only one monthly letter report.

3.5.3 Phase III

The reports for this phase shall consist of two monthly letter progress reports and a final report containing the test data from the four replicas.

3.6 Meetings

4 meetings - East Coast.

4.0 SCHEDULE

4.1 Phase I - This phase shall be completed two months after receipt of order.

4.2 Phase II - The total time period for this phase shall be eight months. Since the establishment of a successful technique may occur at the conclusion of any one of the four trials, the time intervals for the individual trials are listed below. Therefore, the total Phase II schedule may vary from three to eight months.

4.2.1 The first trial shall be completed in three months.

4.2.2 The additional three trials shall not exceed two months each.

4.3 Phase III - The four replicas of the 10 x 10 master produced during this phase shall be delivered three months after receipt of a go-ahead for Phase III efforts, but in no case in less than seven months from the program start. Delivery of pairs is acceptable.